



combined heat & power in a brewery

Sierra Nevada Brewery 1MW direct fuel cell/CHP system

Project Profile

Quick Facts

Location: Chico, California

Capacity: 1 MW (four 250-kW FuelCell Energy DFC300A molten carbonate fuel cells)

System Online: 2005

Hydrogen Production Method:
Digester gas from brewing process

H₂- Production Capacity:
Approximately enough to fuel one 250-kW fuel cell

System Efficiency: Estimated 50% electric efficiency, 75% using CHP

Total Project Cost:
\$7 million over five years

Expected Electricity Cost Savings:
\$400,000/year

Expected Payback Time: 5 years (with incentives and using digester gas)

Funding Sources:
Sierra Nevada Brewery
California Energy Commission, U.S.
Department of Defense

Project Overview

The Sierra Nevada Brewery in Chico, California is producing hydrogen from byproducts of the company's beer brewing process. Founded in Chico in 1980, Sierra Nevada applies resource conservation and reusing/recycling raw materials as guiding operating principles.

Beer brewing uses a two-step anaerobic and aerobic digester process that produces methane, which is then captured and directly reformed into hydrogen.

The brewery has installed four 250-kW molten carbonate fuel cells that run off a combination of natural gas and hydrogen produced from the brewery digester gas.

The fuel cells are high-temperature molten carbonate fuel cells from FuelCell Energy Inc. They will provide almost 100 percent of the facility's baseload power, and the waste heat will be collected as steam and used for the brewing process as well as other heating needs onsite. The fuel cells initially ran off of natural gas, but as the digester gas is integrated into the project the brewery expects to displace 25-40%

of the natural gas use with the digester gas, depending on what type of beer is being brewed. The fuel cell system was installed by Alliance Power, a distribution partner of FuelCell Energy. Alliance Power is performing all aspects of project implementation including siting, planning, permitting, designing, constructing, financing, and operating.

Sierra Nevada is purchasing electricity from the fuel cells through a power purchase agreement established between Alliance Power and FuelCell Energy. Sierra Nevada has the option to purchase the fuel cell power plant from Alliance Power and FuelCell Energy after 12 months of operation.

Financial Incentives

The total project cost for the first five years is approximately \$7 million, including installation costs and operation and maintenance for the hydrogen production system and the fuel cells. The Sierra Nevada Brewery received \$2.4 million in funding from Pacific Gas and Electric Co. through the California Public Utility Commission (CPUC) Self Generation Incentive Program and \$1 million from the U.S. Department of Defense Climate Change Fuel Cell Program. Given these initial subsidies, project managers expect a payback of less than five years, which reflects an electricity cost savings of about \$400,000 per year.



“Like any business, Sierra Nevada was looking for stable, affordable, reliable power, and they wanted to limit the environmental impact of their operation. They found the answer in a hydrogen fuel cell that generates power on site.”

*Arnold
Schwarzenegger
Governor of
California*

Air quality improvement is equal to an elimination of 500 gasoline cars.

The overall energy efficiency of the installation is double compared to grid-supplied power.

California Self Generation Incentive Program

CPUC/PG&E's Self-Generation Incentive Program provides financial incentives to help support the costs of on-site electric generating systems utilizing either solar, wind, fuel cell, micro turbine or internal combustion engine cogeneration systems. Program participants are eligible to receive incentives under this program for installing distributed generation technologies based on system type, size, fuel source and out-of-pocket costs. Only commercially available and factory new equipment is eligible for incentives. Rebuilt or refurbished equipment is not eligible to receive incentives under this program. The maximum system size is 5 MW (and the incentive payment is capped at 1 MW).

Example SGIP Incentive Levels for Advanced Technologies (as of July 1, 2006)

Level	Technology	Incentive	Eligible Size Range
Level 1	Solar photovoltaic	\$2.80/Watt	30 kW – 5 MW
Level 2	Renewable fuel cells	\$4.50/Watt	30 kW – 5 MW
	Renewable micro-turbines	\$1.30/Watt	No min size – 5 MW
Level 3	Non-renewable fuel cells	\$2.50/Watt	No min size – 5 MW
	Non-renewable microturbines	\$0.80/Watt	No min size – 5 MW

Further information can be found at

Sierra Nevada Brewery: www.sierranevada.com
 Alliance Power, Inc: www.alliancepower.com
 FuelCell Energy, Inc: www.fuelcellenergy.com
 Self-Generation Incentive program:
www.pge.com/suppliers_purchasing/new_generator/incentive/index.html
 PRAC: www.chpcenterpr.org

Version 1.2 12/19/06

Contact Information

Tim Lipman
 Pacific Region CHP Application
 Center, Energy and Resources
 Group, UC Berkeley
 2105 Bancroft Way, 3rd Floor
 Berkeley, CA 94720-3830
 Tel: (510) 642-4501
 Email: telinman@berkeley.edu

